Observation of a Fractional Quantum Hall State at ν=1/4 in a Wide GaAs Quantum Well

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Fractional quantum Hall (FQH) states at Landau level filling fractions (ν) with even denominators are currently of much interest due to the possible relevance to certain quantum computation schemes.

We report the first observation of a FQH state ν=1/4. Using the Hybrid magnet facility at NHMFL to produce magnetic fields approaching 45 T, we have measured the diagonal (R_{xx}) and Hall (R_{xy}) resistances of a 50 nm GaAs/AlGaAs quantum well sample. As shown in Figure 1, when the sample is perpendicular to the applied magnetic field a kink is seen in R_{xx} at ν=1/4. With the sample tilted to an angle of 20.3 degrees a clear minimum is observed in R_{xx} accompanied by a plateau in R_{xy}, indicating a FQH state at ν=1/4. The origin of this new state has not been determined.

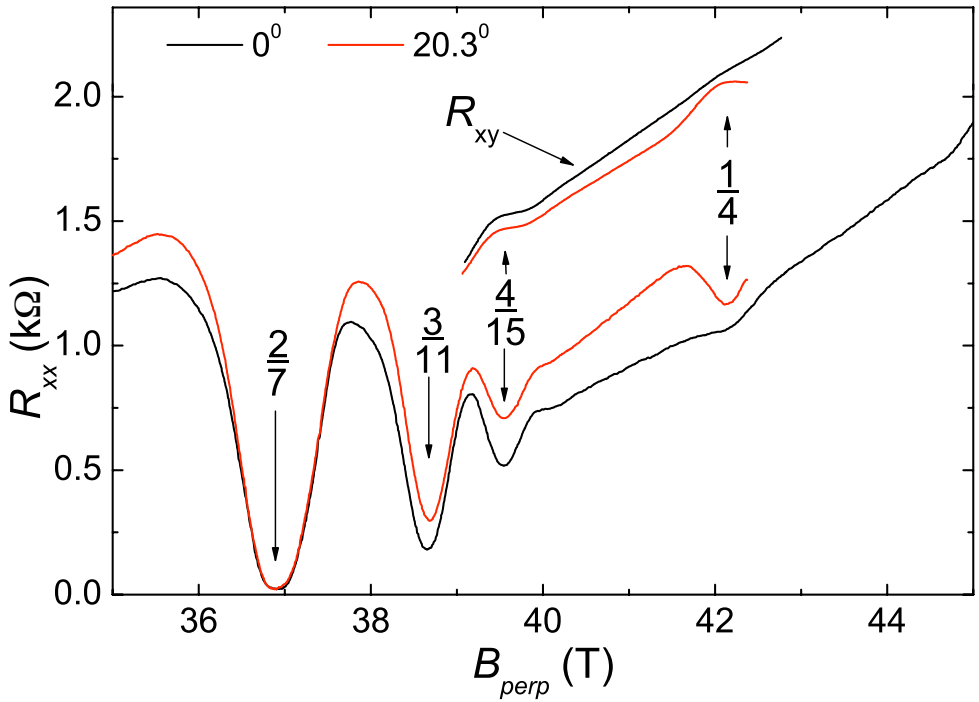

Figure 1: R_{xx} is shown near ν=1/4 with the sample perpendicular to the magnetic field and tilted to angle of 20.3 degrees. Fractional values of ν are indicated. The Hall resistance (R_{xy}) is also shown.

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